TABLE CAPTIONS

Table 1. Summary table of sites for Leg 204 updated after the Pollution Prevention and Safety Panel meeting of 3–4 December 2001. All sites are approved as listed.

Table 2. Time estimates for Leg 204: primary and secondary sites.

Table 3. Leg 204 alternate sites.

FIGURE CAPTIONS

Figure F1. **A.** Map of the Cascadia subduction zone. The box shows the location of the topographic map shown in B. **B.** Bathymetric map of the Cascadia accretionary prism in the vicinity of Hydrate Ridge. NHR = north Hydrate Ridge summit, SHR = south Hydrate Ridge summit; SEK = Southeast Knoll. Locations of the 3-D seismic survey and the 2-D seismic profiles shown in Figure F2 are also indicated. **C.** Bathymetric map of southern Hydrate Ridge. Locations of the planned drill sites are also shown (solid circles = primary sites, open circles = alternate sites). EM300 bathymetric data are from Clague et al. (2001).

Figure F2. **A.** Seismic profile across the northern part of the 3-D seismic survey (1989 line 2). The frontal thrust, décollement surface, ocean basement, and approximate outline of the area shown in Figure 4 are marked. This profile is tentatively interpreted to show stepping down of the décollement and underplating of subducted sediments beneath Hydrate Ridge. **B.** Line 1 from the 1989 survey, which crosses Hydrate Ridge just south of the 3-D survey. Relatively gentle folding of sediments on the western flank of Hydrate Ridge suggest that vergence of the deformation front has recently changed from landward to seaward. A possible step in oceanic basement is also shown. Oceanic basement is ~7 km beneath the summit of Hydrate Ridge. SP = shotpoint, BSR = bottom-simulating reflector.

Figure F3. **A.** Massive hydrate from the summit of southern Hydrate Ridge. **B.** Porous hydrate from the summit of southern Hydrate Ridge (from Suess et al., 2001). **C.** Thin section of macroscopically massive hydrate showing porous structure (from Bohrmann et al., 1998). The thin section measures ~6 cm across. **D.** Acoustic “bubble” plumes from three sites on the Oregon margin (see Fig. F1B), recorded by a Seabeam 2000 12-kHz echo sounder. **E.** Phase diagram for methane hydrate in seawater. The depths of the northern and southern summits of Hydrate Ridge, the measured temperature gradient at Site 892, and the temperature-depth profile from a concentration/temperature/depth (CTD) cast on northern Hydrate Ridge are also shown. Hydrate should be stable at the seafloor and in the water column to a depth of ~450 m over Hydrate Ridge.

Figure F4. **A–D.** Seismic slices from the 3-D seismic data that illustrate the characteristics of reflection A. **E–H.** Slices that illustrate reflections B, B′, and C. **I.** The locations of these profiles are shown on the map, which has topographic contours overlain on deep-towed side-scan data (Johnson and Goldfinger, unpubl. data). Note the bright spot southwest of the summit. It probably defines the extent of a buried apron of carbonates that surrounds the carbonate "pinnacle" that was discovered during *Alvin* dives in 1999. This carbonate structure sits in a moat and rises ~50 m above the surrounding seafloor (C). Its shadow appears in the side-scan data as a black spot within the bright spot. Dives show abundant vent fauna in cracks on the pinnacle, indicating aqueous fluid flow, but no bubbles have been observed. In the seismic data, this feature is characterized by blanking of underlying seismic reflections. A "tongue" of intermediate-strength seafloor reflectivity northeast of the pinnacle probably delimits the region of massive hydrate at the seafloor and appears in the seismic data as a region of bright, chaotic reflectivity (B). All bubbles observed on southern Hydrate Ridge via submersible or 12-kHz echo sounder emanate from this summit region. Reflection pair B, B′, and C are associated with anticline A (Fig. F5) on the eastern flank but are not associated with any reflectivity anomalies on the seafloor. **J.** Predicted and observed BSR depths along line 230. Fine lines show predicted bottom-simulating reflector (BSR) depths for different assumed temperature gradients. The lower of the two solid lines is for an assumed seafloor temperature of 4°C; the upper fine line is for a seafloor temperature that decreases linearly from 4° to 3°C as depth increases from 800 to 1200 m, as indicated by hydrographic data (Trehu et al., 1995). The thick dashed line is calculated from line 230 assuming a constant average velocity between the seafloor and the BSR of 1.6 km/s. A temperature gradient of ~0.7°C/km is suggested for the saddle between the axis of the ridge and anticline A; a gradient of 0.055°C/km is suggested for the slope basin. Open symbols show effects of uncertainties in average velocity. A velocity of 1.8 km/s above the BSR removes the apparent thermal anomaly at a water depth of 860–900 m; a velocity of 1.5 km/s removes the anomaly for water depths >1020 m. This figure illustrates the difficulty of resolving small differences in apparent temperature gradient from the BSR data in this region.

Figure F5. An east-west slice through the 3-D data volume, converted to depth using a 3-D velocity model determined through tomographic inversion of first arrivals recorded on OBSs (Arsenault et al., 2001). Sites to be drilled during Leg 204 are shown. Primary Site HR2alt is in a similar setting as HR2altB, which has been approved by the Pollution Prevention and Safety Panel as a backup site in case we encounter difficulties at proposed Site HR2alt. The BSR and reflectivity of underlying strata are brighter at proposed Site HR2alt than at HR2altB. The solid green line marks the boundary between low-amplitude, low-frequency, chaotic reflectivity, interpreted to be highly deformed sediments of the accretionary complex, and overlying reflective strata. This boundary corresponds to a rapid increase in velocity from <1.8 to >2.0 km/s. The dashed green line delimits a zone of intermediate reflectivity. Reflections marked A, B, B′, and C and anticlines A and B are discussed in the text. VE = vertical exaggeration.

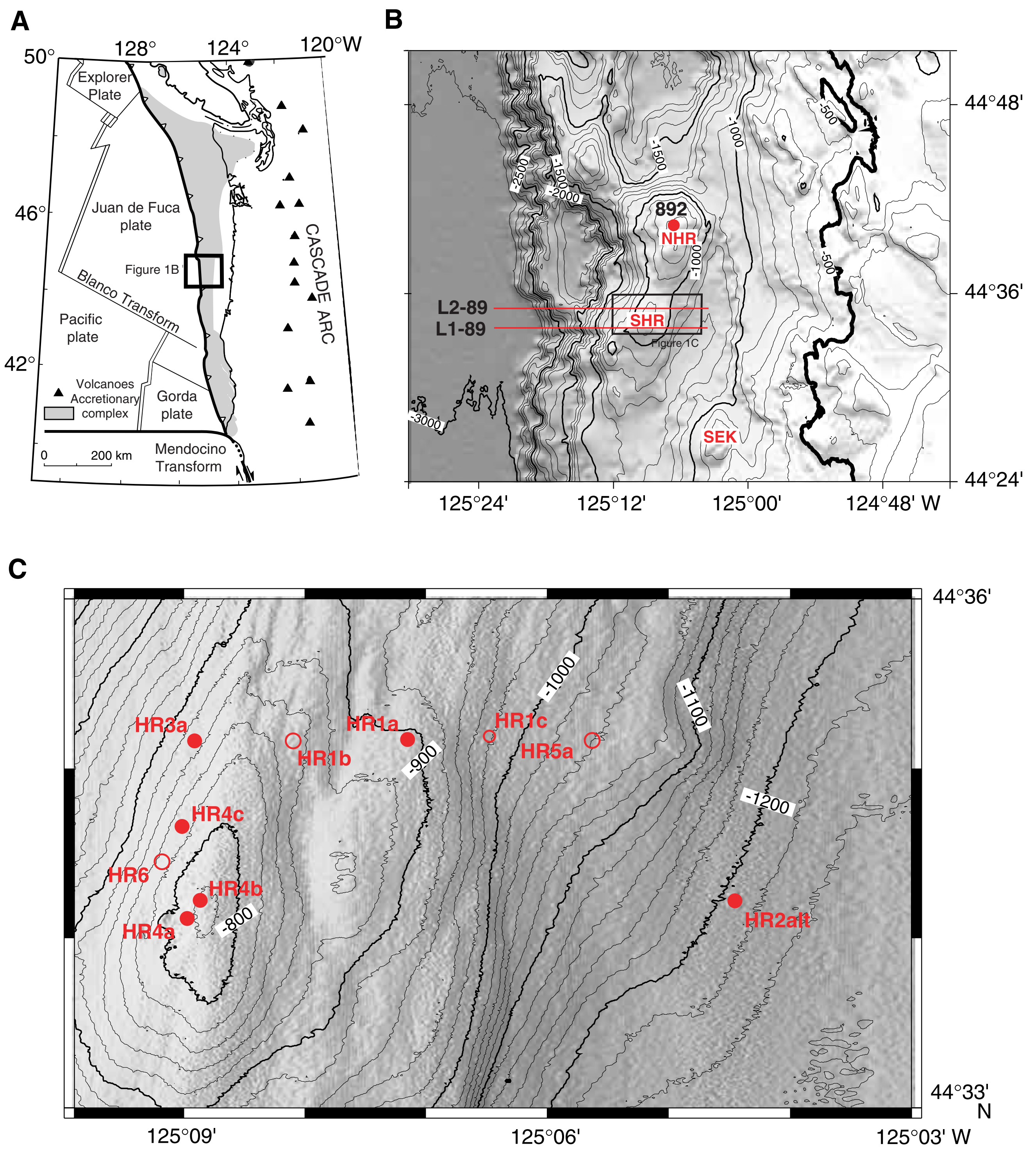
A
50°
128°
124°
120°W
46°
42°
Explorer Plate
Juan de Fuca plate
Figure 1B
Blanco Transform
Pacific plate
Gorda plate
Volcanoes
Accretionary complex
0
200 km
Mendocino Transform
CASCADE ARC
B
892
NHR
L2-89
L1-89
SHR
Figure 1C
SEK
-2500
-1500
-2000
-1000
-500
-3000
44°48'
44°36'
44°24'
125°24'
125°12'
125°00'
124°48' W
C
HR3a
HR1b
HR1a
HR1c
HR5a
HR4c
HR6
HR4b
HR4a
HR2alt
-1000
-1100
-900
-1200
-800
44°36'
44°33' N
125°09'
125°06'
125°03' W

Figure F1

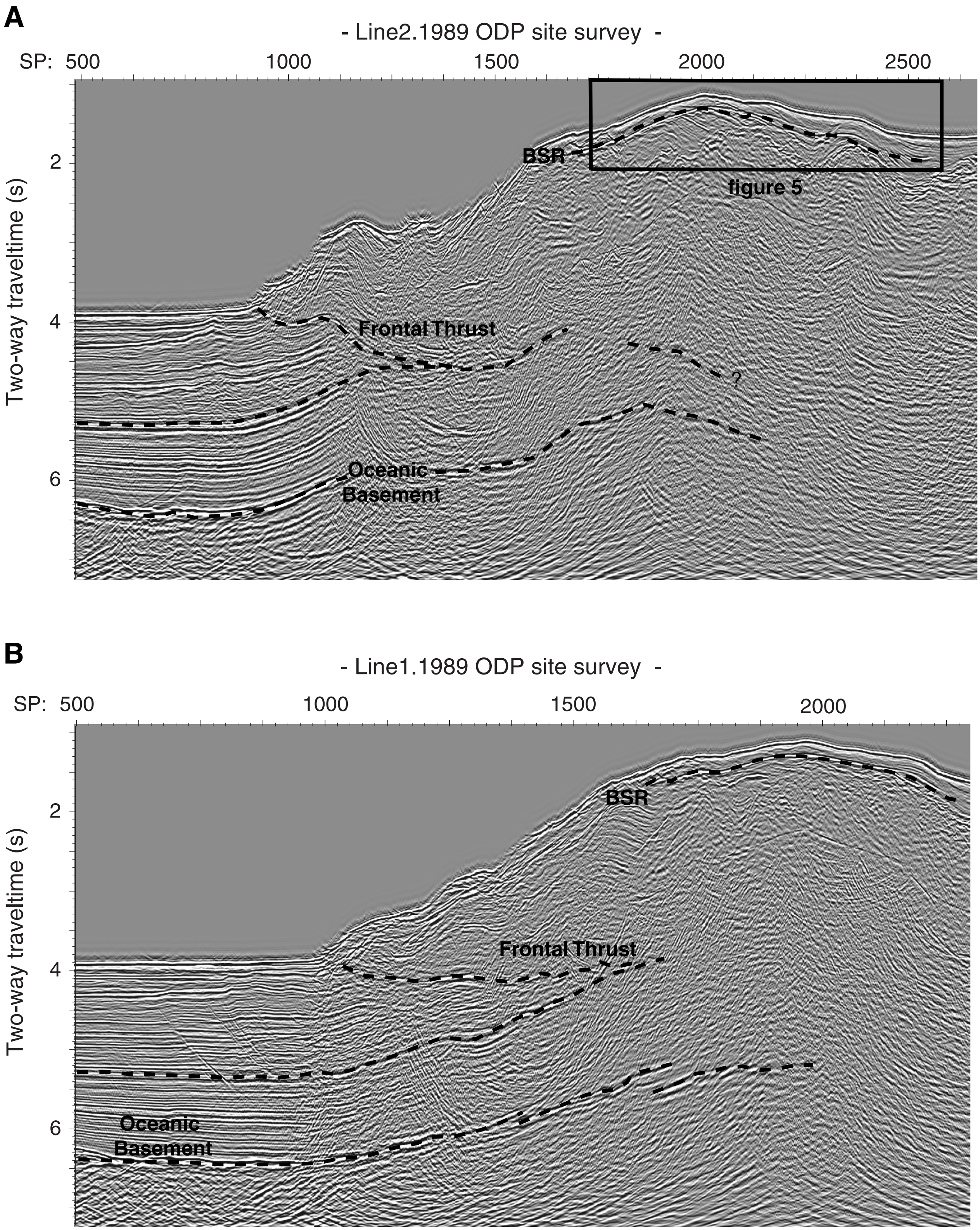
A
- Line2.1989 ODP site survey -
SP: 500
1000
1500
2000
2500
Two-way traveltime (s)
2
4
6
BSR
figure 5
Frontal Thrust
?
Oceanic
Basement
B
- Line1.1989 ODP site survey -
SP: 500
1000
1500
2000
Two-way traveltime (s)
2
4
6
BSR
Frontal Thrust
Oceanic
Basement

Figure F2

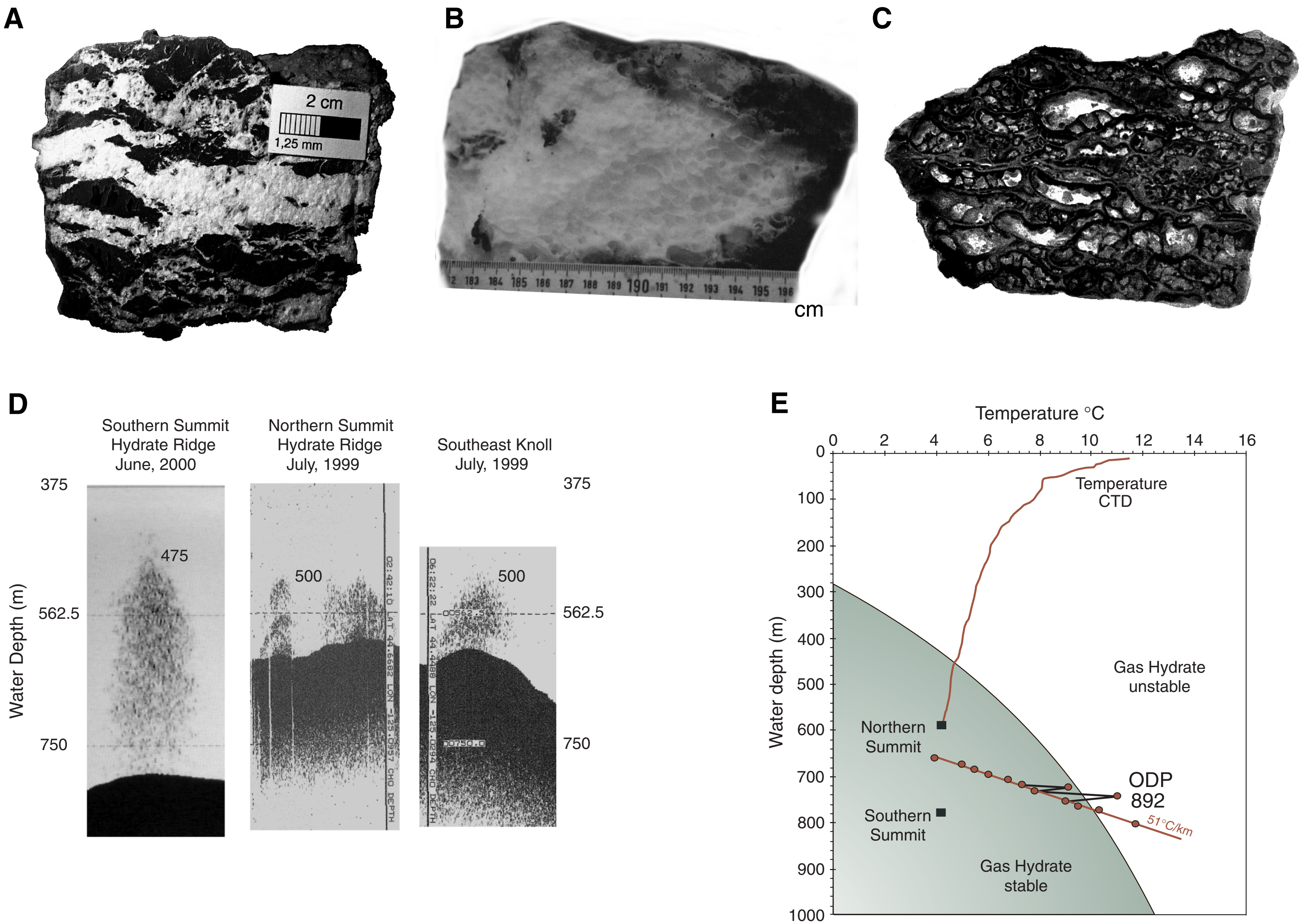
A
2 cm
1,25 mm
B
cm
C
D
Southern Summit
Hydrate Ridge
June, 2000
Northern Summit
Hydrate Ridge
July, 1999
Southeast Knoll
July, 1999
Water Depth (m)
375
562.5
750
475
500
500
E
Temperature °C
0
2
4
6
8
10
12
14
16
Water depth (m)
0
100
200
300
400
500
600
700
800
900
1000
Temperature
CTD
Gas Hydrate
unstable
Northern
Summit
ODP
892
Southern
Summit
51°C/km
Gas Hydrate
stable

Figure F3

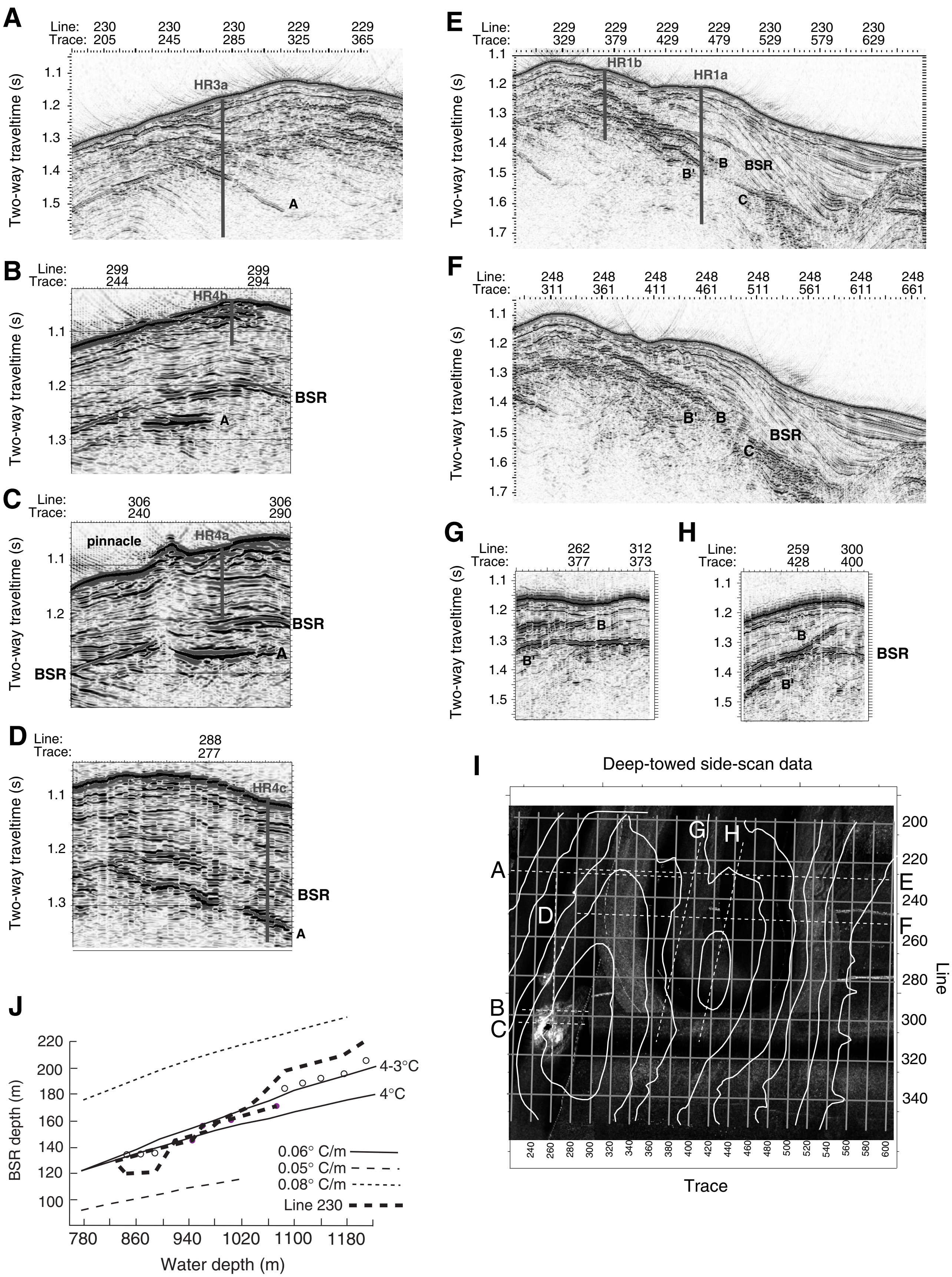
A
Line: 230 230 230 229 229
Trace: 205 245 285 325 365
HR3a
A
Two-way traveltime (s)
B
Line: 299 299
Trace: 244 294
HR4b
BSR
A
C
Line: 306 306
Trace: 240 290
pinnacle
HR4a
BSR
A
BSR
D
Line: 288
Trace: 277
HR4c
BSR
A
E
Line: 229 229 229 229 230 230 230
Trace: 329 379 429 479 529 579 629
HR1b
HR1a
B'
B
BSR
C
F
Line: 248 248 248 248 248 248 248 248
Trace: 311 361 411 461 511 561 611 661
B'
B
BSR
C
G
Line: 262 312
Trace: 377 373
B
B'
H
Line: 259 300
Trace: 428 400
B
BSR
B'
I
Deep-towed side-scan data
Line
Trace
J
BSR depth (m)
Water depth (m)
4-3°C
4°C
0.06° C/m
0.05° C/m
0.08° C/m
Line 230

Figure F4

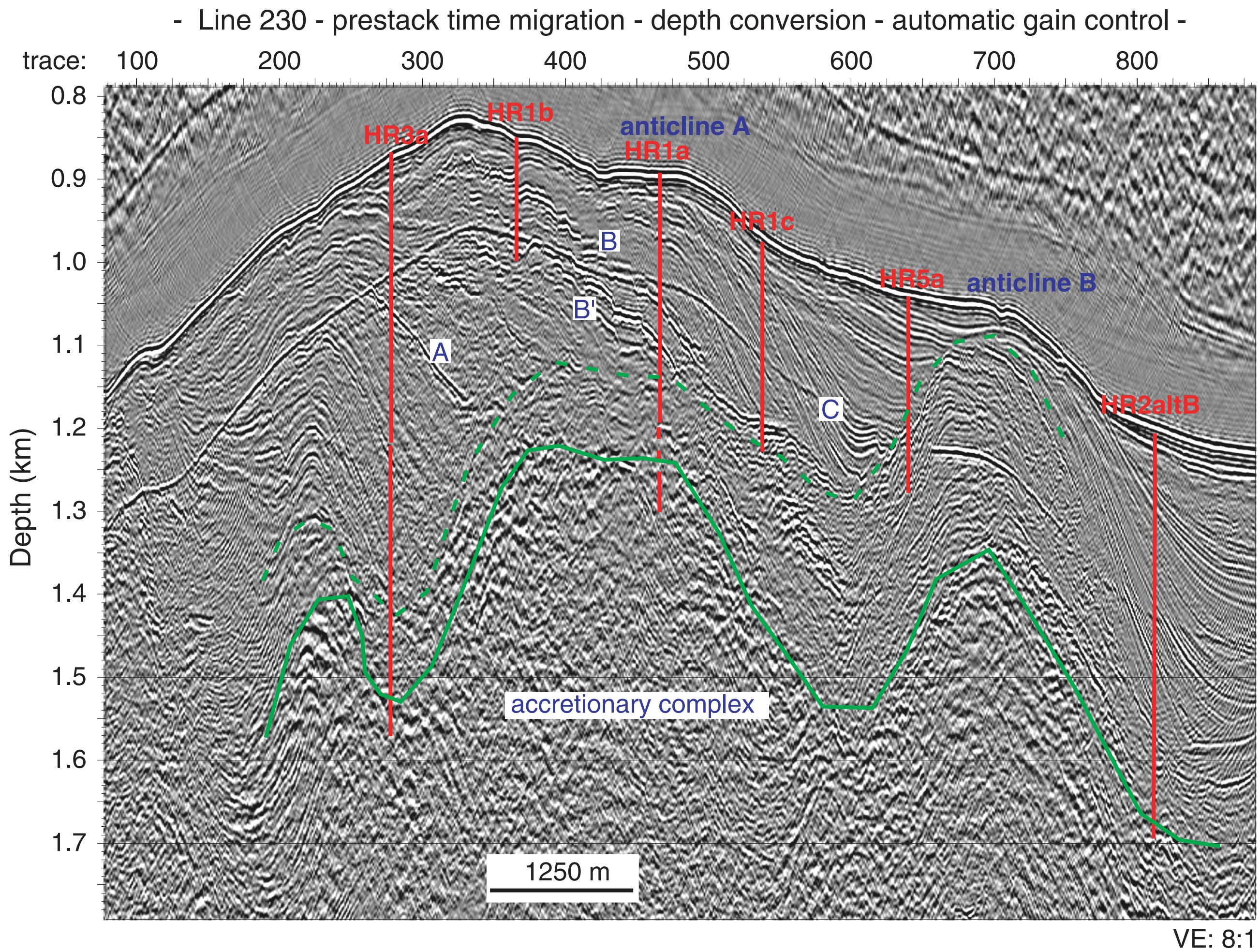
- Line 230 - prestack time migration - depth conversion - automatic gain control -
trace: 100 200 300 400 500 600 700 800
Depth (km)
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
HR3a
HR1b
anticline A
HR1a
HR1c
HR5a
anticline B
HR2altB
B
B'
A
C
accretionary complex
1250 m
VE: 8:1

Figure F5